S.4 TERM ONE 2025 GRAND HOLIDAY PROGRAM

Chemistry subject has two papers at the end of the cycle. These are paper one (theory) and paper two (practical)

Theory paper-paper one (545/1)

The theory paper chemistry 545/1 consists of two sections, A and B. It has six examination items.

Section A has two compulsory items.

The two scenario items require **filling responses** from the **item taker**. And these come from **2nd element** of **construct** and **3rd element of construct** for items **1** and **2.** These can be interchanged depending on item writer of the day.

Section **B has two** parts; **I and ll.**

It has four scenario items that require **extended responses** from the item taker.

A candidate is supposed to answer one item from each part. Items from **part I** (item **3** and **4**) are from the **1st element** of **construct** while those from **part ll** (item **5** and **6**) are from the **4th** element of construct.

Duration of the paper is **2hours.** Total score will be **60.**

Practical paper-paper two (545/2)

This paper consists of one compulsory item. It comes from the fifth element of construct

ELEMENT OF CONSTRUCT-EOC

An element of construct is a group of related competences (learning outcomes) that can be assessed together. This is to avoid duplication/multiple testing of competences. In chemistry, there are **five elements of construct**, **four** for theory and **one** for practical.

1ST ELEMENT OF CONSTRUCT

The learner appreciates contribution of chemistry to our economy. **(For items 3 and 4 in part one of section B)**

TOPICS UNDER FIRST ELEMENT OF CONSTRUCT

- Industrial processes
- Air. (Mainly on manufacture of oxygen.)
- Chemistry and society.
- Carbon in life. (Mainly on crude oil, fermentation and saponification)
- Chemical reactions. (Mainly contact, Haber processes)

- Oxidation and reduction. (In iron extraction and for concepts of electrolysis in extraction of aluminium, copper manufacture of sodium hydroxide and chlorine)

ASSESSABLE AREAS

(a) Manufacture of oxygen gas	(f) Manufacture of sodium hydroxide
(b) Manufacture of chlorine gas	(g) Manufacture of sulphuric acid
(c) Extraction of metals (Al, Fe, Cu)	(h) Manufacture of cement
(d) Manufacture of fertilizers	(i) Manufacture of Ethanol
(e) Manufacture of detergents	(j) Manufacture of bio gas
	(k) Manufacture of ammonia

Note: In each process of manufacture a learner should mention the following;

V-vessel, **Cp**-chemical processes, **Cd**-conversion to desired product, **Ch**-coherence, **Pr**-purification

SCORING GUIDE FOR THE FIRST ELEMENT OF CONSTRUCT

When attempting items 3 and 4 in part one of section B, a learner must mention raw materials (Rm), processes of production (Pp), Side effects of the process of production and mitigation (Se), Social benefits (Sb)

Basis of assessment		Criteria of assessment	Score
A	Raw materials (Rm)	All raw material	02
		any one raw material	01
		no raw material	00
B	Process of production (Pp)	Process of production with alI V, Cp, Ch,Pr	03
		Process of production with any three of V, Cp, Ch, Pr	02
		Process of production with any one of V, Cp, Ch,Pr	01
		No process of production	00
C	Side effects of the process of production and mitigation (Se)	Any one danger identified, explained and mitigated	03
D	Social benefits (Sb)	Any one social benefit identified, effect of the benefit and impact of the benefit	03

Example item

Due to increased prices and demand of copper for use in electrical vehicles worldwide the government is therefore looking forward to revive the copper production in kilembe, a suburb

in kasese District Uganda. The local residents are however worried of its environmental impacts.

The locals also do not know the process of extraction of copper will be done.

A radio talk show has been organized on one local radio station by the district development officer (DDO) and the local council representatives to sensitize the locals on the issue at hand.

TASK

As a learner of chemistry, prepare a presentation you would make upon invitation.

Responses

Raw materials

Copper pyrites, Water, Frothing agent, Silica/ sand, Lime stone, Air

Process of copper production

- The ore is crushed and mixed with water containing a frothing agent (e.g oil and other chemicals) in large metallic tanks. This mixture is agitated by blowing in air. This helps to separate the ore from earthy impurities. The ore is carried to the top in froth and impurities seek to the bottom. The froth is filtered off and acid is added to break it. The mixture is filtered off to obtain a concentrated ore.
- The concentrated ore is roasted in air to produce copper (I) sulphide, Sulphur dioxide and iron (II)oxide.

  Equation for the roasting the concentrated ore is;

  $$2CUFeS_2(s)+4O_2(g) \longrightarrow CU_2S(s)+2FeO(s)+3SO_2(g)$$

- The roasted product is mixed with silicon dioxide(sand) and limestone and heated in the absence of air in the furnace.
- This helps to convert solid iron (II) oxide which is an impurity into molten slag which is poured off to leave behind copper sulphide.

  The equation involved is $FeO(s) + SiO_2(g) \longrightarrow FeSiO_3(l)$
- The copper(I) sulphide is reduced to impure copper by heating it in a regulated supply of air oxygen).

  The equation involved is; $CU_2S(s) \longrightarrow CU(s)+SO_2(g)\cdot$

- The impure copper (blister copper) formed is purified or refined by electrolysis as follows;
  - The electrolytic cell is made up of impure copper/ blister as the anode and pure copper serves as the cathode. The electrolyte is acidified copper (Il) sulphate solution
  - During electrolysis;
    At the anode, pure copper dissolves to form copper(I1) ions. Impurities are left behind
  - At the anode pure copper is deposited
  - Equation is $Cu^{2+}(aq)+2e \longrightarrow Cu(s)$

Negative effects to the copper plant on the environment.

Social benefits

- Employment opportunities; improved income thus better standard of living.

ITEM TWO

Uganda Battery Limited (UBL) is one of Uganda's leading car battery manufacturers. The company uses Sulphuric acid as the main electrolyte in their batteries. In a bid to cut the costs on high revenue imposed on importing the acid, the management has contracted a production unit to setup a sulphuric acid production plant with minimal environmental concerns. A certain village near Kilembe mines in Kasese district has been selected for the plant. However, some residents in the region claim that the plant will not benefit them at all.

The science club members in your school would like to know how the production process will be carried out. They are seeking for your guidance prior to addressing the school assembly

Task;

As a chemistry learner, make a write up they will use during the presentation while addressing the assembly.

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ITEM THREE

The government of Uganda is planning to set up an iron and steel **rolling factory** in Kisoro District due to the many iron deposits in the hilly districts. This is **intended to** improve the livelihood of the residents and to make use of the iron. However, the residents think that the government is on the move of selling their **land** to **investors.** This is all because they lack knowledge on how the process of Iron **extraction** is **done.**

The chairperson LCV has invited chemistry students from your school to sensitize the residents on this matter.

Task:

Write a presentation you will use upon meeting the residents.

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ITEM FOUR

Ethanol is one of the main raw materials in the manufacture of sanitizers. Due to the wide spread of red eye illness in schools, there is an increased demand for the sanitizers among the schools. However, the government is facing a problem of low supply of sanitizers in the country. On this note, it is planning to set up an ethanol production plant with minimal environmental impact. The locals keep doubting its impact to their social being. They claim that the government wants to take up their valuable land in the process.

The chairperson of the village has contacted you as an educated member of the community to make a write up she will use during a presentation in a community meeting on how the process of production would be carried out.

Task

As a chemistry student, make a write up she will use during plenary.

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ITEM FIVE

Ammonium nitrate is used on a large scale to manufacture fertilizers which are highly needed by the farmers. In an attempt to continue supporting the country's agricultural sector. The government is seeking to ensure a steady availability of ammonium nitrate and thus has hired an investor to set up a production plant with minimal environmental impact in Kitambala town. However, the town community would like to know how the production process will be carried out and how will they benefit from this plant.

The new chemistry club president of your school has contacted you in preparation for his speech prior to his inauguration ceremony, on how the process of production can be carried out.

Task:

As a chemistry learner, make a write up you will develop for the president.

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ITEM SIX

Cement is one of the ingredients required for constructing good and strong houses. Following the increased demand for cement due to increased need for human settlement, the government has hired a local investor to construct a new cement manufacturing factory in Tororo district to ensure an increased supply of cement countrywide.

The district locals are concerned about the environmental effects that will result upon construction of the factory in their district and how the production process will be conducted.

Task:

Prepare a presentation you will make answering the concerns of the locals.

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ITEM SEVEN

In Uganda, copper wires are used mainly for transmitting electric power. To ensure the availability of wires, the government is considering setting up a copper production plant in a certain area. However, the residents of the area need to be sensitized about the industrial processes, social

benefits, side effects and how they can be overcome. Your head teacher has been identified to sensitize the residents. Task: As a learner of Chemistry, prepare a write-up that your head teacher will use to sensitize the residents.

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ITEM EIGHT

Cement is one of the most commonly used building materials. In order to meet the high demand of cement in Uganda, many cement factories have been set up across the country. You are part of the Chemistry class that visited one of the factories and the process of producing cement was explained to the class. You have been invited to a radio talk show to explain how cement is produced. After your presentation one of the callers wants to know whether there is any impact associated with the process you have talked about

Task: Make a write-up of the sensitization message up to the end of the talk show.

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SECOND ELEMENT OF CONSTRUCT-EOC 2

The learner appreciates the application of chemistry in daily life. **(For items 1and 2)**

TOPICS;

- Chemistry and society
- Chemicals for consumers. (Mainly food additives, medicine and drugs and detergents.
- Nuclear processes.

ASSESSABLE AREAS

1.Food Additives		**2.Drugs and Medicine**	**3. Nuclear Processes**	**4. Detergents**
Flavour enhances Preservative Glazing agents Gelling agents Anti-oxidants Bulking agents	Beverages Dyes (food colors) Stabilizers Thickeners Biological enzymes Whitening agents Firming agents	Modern medicine such as Antibiotics (penicillin & streptomycin) Analgesics (Aspirin, paracetamol codeine) Traditional medicine such as Herbal medicine	Nuclear fission Nuclear fusion Nuclear decay and half life	Soapy detergents Soapless Detergents

SCORING GUIDE FOR THE SECOND ELEMENT OF CONSTRUCT

When attempting items 1 and 2 in part one of section A, a learner must mention; Category/type of product, function of the product, Dangers or Side effects of the product and mitigation, evaluate the name products by comparing them.

Basis of assessment		**Criteria of assessment**	**Score**
A	Category/type of product	Any one product and category/type of product identified	02
B	Function(s) of product(s)	Anyone function of product(s)	01
C	Dangers or Side effects of the product and mitigation	Any one danger/side effect identified explained and mitigated	03
D	Evaluation of products/processes	Evaluation of products/processes	02

Summary notes on the assessable areas for EOC 2.

A. FOOD ADDITIVES

Basis of assessment	Expected responses
Category of the product	Food additives like flavour enhancers, food colours, food preservatives are classified as 1. Natural food additive. 2 Synthetic food additives
Functions of the product	Food enhancers; boost existing food flavours Food colour; add colour to the food Food preservatives; increase the shelf life of food
Dangers/side effects + explanation + mitigation	Some people are allergic to some synthetic food additives that may lead to skin irritation or diarrhoea on prolonged use. Natural food additives quicken the rate of food spoilage due to rapid growth of microbes. -use recommended amounts -limit their use
Evaluation of the product	Similarities; - both make food delicious -Both can preserve food Differences -Natural food additives are less effective in action than synthetic -Natural food additives have fewer side effects than synthetic

B. NUCLEAR PROCESSES

Basis of assessment	Expected responses
Category of the product	Nuclear processes are classified as 1. Nuclear fission. 2.Nuclear fusion
Functions of the product	Nuclear fission; -used in nuclear reactors of generate electricity from nuclear energy - Used in atomic bombs. Nuclear fusion; -It is a fuel

<table>
<tr><td>Dangers/side effects
+ explanation
+ mitigation</td><td colspan="2">-Radiations may lead to mutations in DNA leading to hereditary defects like leukemia
-Radiation burns on the skin.
-Reduced fertility
-Radiations damage the liver
-Proper disposal of atomic wastes
-Proper use of correct personal protective equipment</td></tr>
<tr><td>Evaluation of the product</td><td colspan="2">Similarities;
- both involve a large release of energy.
Differences</td></tr>
<tr><td></td><td>Nuclear fission</td><td>Nuclear fusion</td></tr>
<tr><td></td><td>Heavy nuclei split to lighter nuclei</td><td>Lighter nuclei join to form heavy nuclei</td></tr>
<tr><td></td><td>Can take place at ordinary temperature</td><td>Takes place at high temperature</td></tr>
<tr><td></td><td>Very high energy released</td><td>Relatively low energy released</td></tr>
<tr><td></td><td>Occurs in heavy nuclei</td><td>Occurs in lighter nuclei</td></tr>
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C. MEDICINE AND DRUGS

Basis of assessment	**Expected responses**
Category of the product	Medicine and drugs are classified as; MEDICINES OR 1.modern medicine 2. traditional medicine (herbal medicine)
Functions of the product	Depending on the scenario set Analgesics; pain killers Anti-biotics; kill bacteria
Dangers/side effects +explanation + mitigation	That may lead to skin irritation or diarrhoea on prolonged use. -use recommended dose
Evaluation of the product	Similarities; - Both are pain killers. (Depending on the scenario)-Both are antibiotics. (Depending on the scenario) -Both are medicines (traditional vs modern) Differences -Herbal medicines are less effective in action than synthetic -Herbal medicines have fewer side effects than

	Modern

D. DETERGENTS

Basis of assessment	**Expected responses**
Category of the product	Detergents are classified as 1. soapy detergents (soap) 2. soap less detergents
Functioning of the product	- A detergent/ soap molecule contains two parts; namely; the hydrophilic part (loves water but hates dirt) and hydrophobic part (loves dirt but hates water). -During washing, the surface tension between water and oil/dirt is lowered. -With constant agitation, the dirt is removed off the cloth.
Dangers/side effects +explanation + mitigation	For soapy detergents. ·Soap contains chemicals that can cause skin burns and hence pain. ·Eye redness and pain hence loss of vision. **Mitigation;** thoroughly washing the affected areas. Soapless detergents contain phosphates, an algae nutrient leading to algae bloom that cuts off oxygen supply to the aquatics. Eventually, leading to suffocation and hence death **Mitigation**; Proper disposal of detergents
Evaluation of the Product	Similarities: -Both are salts of Organic acids of long carbon chain. -Both are effective cleansing agents in soft water Differences;

Soapy detergents	Soapless detergents
Forms scum with hard water.	does not form scum with hard water

	Gentle on skin when using it.	not gentle on skin
	Biodegradable	Non-biodegradable

Examples

Joan and Priscilla went to wash their clothes around the nearby well surrounded by rocks. Joan used detergent **T** and Priscilla used detergent **Q**. Two days later, Joan realized that her white clothes had some dirty marks yet she rinsed them with water several times. Priscilla, on the other hand, never had such complaints.

Joan is now frustrated and cannot understand what went wrong.

As a result, both Joan and Priscilla have approached you to help them understand their situation.

Task

As a chemistry learner, write a message you will share with the two ladies. In your message;

(a) Explain categories of products, T and Q used by the two ladies

(b) Help Joan to understand how the product works

(c) Advice the two ladies on the challenges associated with the use of the products.

Responses

Category

Joan used soapy detergent while Priscilla used soapless/synthetic detergent

Functions of products / how the product works

Soap acts by lowering the surface tension between dirt and water. This is because soap molecules is made up of two parts; water- soluble (hydrophilic) and dirt-soluble part(hydrophobic). The hydrophobic part of soap penetrates/ dissolves the dirt while the hydrophilic part of the soap dissolves in water. With constant agitation, dirt is dislodged from the fabric and carried away by the water

Advice on use;

part1: Danger/ the side effect of products to life/ environment and mitigations

- Soapy/soapless detergents cause skin irritations/blisters/burns on the top layer of a sensitive skin due to the chemical in them. This can be mitigated by using them with care/wear protective gears when using them/irritate the affected area with a lot of water
- Soapless detergents cause water pollution due to the phosphates which accelerate the growth of algae. This can be mitigated by enforcing strict laws on those who was near

the water bodies. Some detergents can cause damage to the fabric due to the excessive alkalis they contain. This can be mitigated by limiting/ minimize/ use

- controlled amount of detergents (or wash the fabric with a lot of water)

Part2: Evaluation based on similarities and differences

Differences:

- Soapless detergents wash effectively in both soft and hard water while soapy detergents wash
- effectively in soft water
- Soapless detergents clean effectively in acidic media while soapy detergents cannot.
- Soapless detergents are usually non-biodegradable while soapy detergents are usually biodegradable.
- Soapless detergents wash brighter than soapy detergents.

Similarities:

- Both are sodium/ potassium salts of long chained organic acids.
- Both are effective cleansing agents in soft/rainy water.
- Both have similar structures; consisting of a hydrophilic head and a hydrophobic tail.
- Both remove dirt and stains out of the clothes through similar mechanism/lowering the surface tension between the dirt and water

ITEM NINE

On their second day at work in a maize milling company, Peter and John complained of muscle pain and headache, Peter decided to take paracetamol tablets which were available in his bag. John took some extract from cassava leaves. After a few hours, Peter got relieved from the pain but John claimed that the pain was still on.

- Task;
- As a chemistry learner,
- (a) Categorize the products Peter and John used.

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  (b) Help John understand how the products work

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(c) Advise Peter on the challenges associated with the long-term use of the product he took.

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TEN

Joan and Priscilla went to wash their clothes around the nearby well surrounded by rocks. Joan used detergent **T** and Priscilla used detergent **Q.** Two days later, Joan realized that her white clothes had some dirty marks yet she rinsed them with water several times. Priscilla, on the other hand, never had such complaints.

Joan is now frustrated and cannot understand what went wrong.

As a result, both Joan and Priscilla have approached you to help them understand their situation.

Task

As a chemistry learner, write a message you will share with the two ladies. In your message;

(a) Explain categories of products, **T** and **Q** used by the two ladies.

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(b) Help Joan to understand how the product works.

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(c) Advice the two ladies on the challenges associated with the use of the products.

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ELEVEN

During the Second World War the cities of Hiroshima and Nagasaki in Japan were bombed using the most lethal weapon of the time, which caused massive destruction as shown in figure 1. However, the energy that was used can be useful in the treatment of cancerous growths in humans. Up to now the impact of the bombing is still being felt in Japan.

Task: As a learner of Chemistry;

(a) Identify the type of bomb used.

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(b) Suggest any other use of the form of energy that was used in the bomb.

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(c) Explain the other danger associated with the form of energy in the bomb and give its mitigation.

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THIRD ELEMENT OF COSTRUCT-EOC 3

Appreciates the diversity and interactions of substances and their importance in everyday life.

(For items 2 and 3 of part 1 in section B)

TOPICS;

- Air
- Using materials
- The periodic table
- Trends in the periodic table
- Structures and bonds
- Structure and properties of substances
- Carbon in life
- Formulae, stoichiometry and mole concept

ASSESSABLE AREAS

(a)Elements, compounds and mixtures	(e) Structure and bonds
(b)The periodic table	(f) The mole concepts
(c)Trends in the periodic table	(g)Materials other than plastic
(d)Reactivity series	(h)Polymers and Plastics

SCORING GUIDE FOR THE SECOND ELEMENT OF CONSTRUCT

When attempting items 2 and 3 in part one of section B, a learner must mention; Category/type of product with a reason, Properties or prediction of properties of element, compound, substance OR material, Uses of element, compound, substance or material/applications/ quantity of matter i.e moles, Impact/pollution of environment by element, compound, substance or material and mitigation

Basis of assessment		**Criteria of assessment**	**Scores**
A	Category of element, compound, substance or material with a reason	Identified category of element, compound, substance or material with a reason and example	03
		Identified category of element, compound, substance or material with either example OR reason	02
		Identified category of element,	01

		compound, substance OR material OR reason only OR example only	
		No identified category of element, compound, substance OR material OR reason OR example	00
B	Properties or prediction of properties of element, compound, substance OR material	At least four properties or characteristics or predictions of trends	03
		At least two properties or characteristics or predictions of trends	02
		Any one property or characteristic or prediction of trends	01
		No property or characteristic or prediction of trends	00
C	Uses of element, compound, substance or material /applications/ quantity of matter i.e moles	Any one use/application	01
		No use/ application	00
D	Impact/pollution of environment by element, compound, substance or material and mitigation	Identified impact and mitigation	02
		Identified impact OR mitigation	01
		No Identified impact OR mitigation	00

Summary notes on the assessable areas for EOC 3.

POLYMERS

Polymer	**Category + reason**	**Properties**	**Uses**	**Impact of environment + mitigation**
Nylon	Synthetic polymer ;man- made	Strong Flexible Tough Durable Lightweight Chemical resistant ·Elastic	·Making clothes, ropes, curtains, carpets, parachutes and car seat belts	·If burnt, produces toxic fumes Mitigation; Recycling. ·Non-biodegradable; Mitigation; Recycling.

Cotton	Natural polymer; exists in nature	Can easily be decomposed by fungi and bacteria. Strong Soft Absorbs moisture	Making bandages, gauze, sanitary products ·Making threads, ropes and canvas Making paper products such as currency, stationary, banknotes etc. ·Making clothing	

Read about other polymers and respond accordingly

USING MATERIALS

Material	**Category of material**	**Properties of material**	**Uses of material**	**Impact of environment by material +mitigation**
Wood	Natural material; exists in nature.	Readily available Cheap Strong Light when dry Easy to smoothen Can rot or be eaten by termites when not treated	Making shutters for doors and windows. Making door flames and window flames. Making struts and ties during roofing. Making poles, pillars and beams.	Unsustainable logging practices can lead to deforestation, loss of bio-diversity, and habitat destruction. Mitigation; -Selective logging, -reforestation.

Plastic	Artificial material; man-made	Flexible Water proof Light and strong Low melting points (can be easily attacked by fire)	·Making pipes for plumbing. Making door and window shutters.	·Non-biodegradable spoils the soil. Mitigation; -recycling

Read about other materials

ELEMENTS

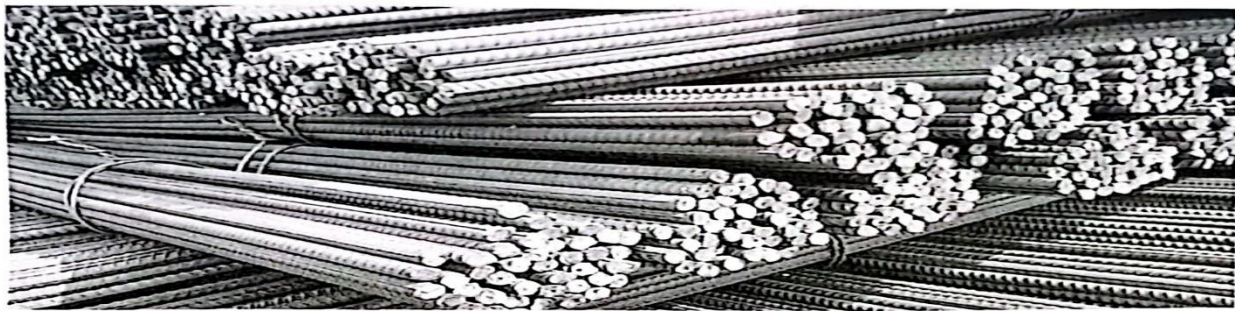
Element	**Category of element with reason**	**Properties of element**	**Uses of element**	**Impact of environment + mitigation**
Sodium	Metal; -loses outermost electron to form a cation.	·Low melting point Ductile Lightweight Conducts electricity Soft ·Shiny appearance	·Used as a coolant in nuclear reactor. ·Used to make alloys like sodium amalgam. ·Used as a reducing agent in the extraction.	·High level of sodiu can disrupt natural ecosystems in area where plants and animals are adapted to salty conditions leading to changein biodiversity. Mitigation; Reduced use of sodium-based fertilizers.
Phosphorous	Non-metal; gains electrons to form anion.	·Soft ·Waxy solid that glows in the dark	·Used to make match heads. · Used to make alloy. · Used in production of phosphoric acid which is used to make fertilizers, detergents.	Excess phosphorous runoff causes eutrophication in water bodies which leads to algal blooms oxygen depletion, fish kills, and degradation of aquatic habitats; Mitigation; Upgrade wastewater treatment plants to remove phosphorous effectively

				before discharge in water bodies.

Read about other elements from the first 20 elements

Example

Task JJK is in the process of making good and strong windows for his newly constructed house without windows.



He also knows that in order for one to produce good quality windows; he should select the right material with suitable qualities and properties. However, he is still confused with the choice and has approached you for some advice.

(a) Explain

(i) Categories of materials.

(ii) The suitability of the materials.

(b) Advise wig on the choice of the materials.

Responses

Category + reason + example

- Materials can be natural/ synthetic.
- Natural materials are God made, exist in nature, its formation is not influenced by man e.g Rocks, sand, wood, water, air
- Artificially/ synthetic materials are man- made e.g Iron bars, plastics, paint, concrete.

Suitability (Properties of materials)

Iron bars

- Very strong/ high tensile strength
- Malleable
- Ductile

- High melting point
- Tough/hard
- Durable if well maintained
- Good weldability

Aluminium

- Very strong/high tensile strength
- Malleable
- Ductile
- Resistant to corrosion
- High melting point
- Tough/hard
- Durable if well maintained
- Good weldability
- Light

Wood

- Strong/high tensile strength
- Light weight when dry
- Sound absorption/ absorbs sound/sound proof (reduces noise pollution)
- Poor electrical conductor when dry/poor conductor of heat
- Tough/hard
- Durable/long lasting if well maintained
- High/ good work ability
- Renewable
- Resistant to chemical attacks

Advice on use

part1: reason for use

Because iron bars are strong/ durable/ tough/ malleable and thus, can be used to make frames

OR

Aluminum is resistant to corrosion and does not rust, rot/ deteriorate when exposed to moisture. Thus can be used to make frames since, aluminum is light; this makes it to reduce the weight on the buildings.

OR

Because wood is strong/ durable/tough and thus, can be used to make frames

Part2: Impacts of the material in the environment+ mitigation

- Iron readily rusts. The rust contaminates both the soil and water stream. The rust is also harmful to plants, and humans. This can be mitigated by recycling/re-using it.
- Wood is obtained from cutting down of trees. This leads to accumulation of carbon dioxide and another greenhouse gases hence, global warming/climate change results. It is also leading to loss of other leaving organisms (animals and birds). It affects water cycle (evaporation levels are disrupted and drying up of moisture in air hence decrease precipitation) and less rainfall/drought results. This can be mitigated by planting trees that grow and mature so fast.
- When released into the water bodies; aluminum is toxic to gill- breathing animals such as fish and invertebrates since it causes damage to their gills, liver and kidneys. This can be mitigated by recycling/re-using it

ITEM TWELVE

Mpigi district development officials recently cleared a group of youths in the district to setup a bakery. However, the officials have cautioned the youths to use sustainable and environmentally friendly packaging materials for their bakery products.

As a result, the youths have organized a meeting to discuss possible alternative packaging materials.

Task

(a) Explain

(i) Categories of materials.

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(ii) The sustainability of the materials.

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(b) Advise the youths on the choice of the materials.

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ITEM THIRTEEN

A team of scientist found a strange substance which they called **X**. They subsequently determined its atomic number and mass number but couldn't put it on the periodic table because they had less knowledge about it. The scientists neither knew any use of the substance nor its effect on the environment. The given symbol of substance **X** is as below.

$$^{39}_{19}X$$

You're required to contribute and help in placing **X** on the periodic table.

Task:

Using the knowledge of chemistry, you have attained

(a) Categories the substance.

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(b) Help them to know the properties of the substance.

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(c) Advise them on effect of substance to environment.

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ITEM FOURTEEN

Tony, while at the construction site for his residential house, the site engineer recommended that he should buy plastic pipes for electrical installation and plastic containers for collecting water at his house. Tony wants to know more about the engineer's recommendations.

Task:

Use your Chemistry knowledge to explore

(i) The category of these recommended materials.

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(ii) The suitability of these materials.

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(iii) The impact of these materials to the environment.

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ITEM FIFTEEN

The police Force of Uganda (PFU) has hired PHILIPS TEXILE COMPANY to manufacture and supply them the soldier's ran coats. However, the PFU procurement officer emphasized production of high-quality rain coats which are unique and comfortable for the officers**.**

The production team knows that a high-quality rain coat depends on properties of the material used.

Task:

Use your chemistry knowledge to;

(a) Explain

(i) **The category of the material the textile company will use.**

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(ii) **The suitability of the material.**

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(b) **The impact of the material to the environment.**

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ITEM SIXTEEN

An industry wanted to produce lime for treatment of acidic soils. The production of lime involves heating limestone strongly which results into its decomposition according to the equation;

$CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$

The industry is also interested to know how much gas is evolved during the process since the gas is useful. Before the production, an experiment was performed where 25g of limestone were heated until there was no further change. You have been contacted for help

Task: As a learner of chemistry; a) Explain the categories of the products.

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b) Suggest the properties of the gaseous product that make it useful in daily life.

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c) Calculate the volume of the gaseous product measured at s.t.p. that was formed.

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FOURTH ELEMENT OF COSTRUCT-EOC 4

Appreciates the existence of natural resources in the environment and their importance in life.

(**For items 5 and 6**)

TOPICS.

- Air
- Water
- Rocks and minerals
- Carbon in the environment
- Fossil fuels

ASSESSABLE AREAS

(a) Air	(d) Carbon based fuels
(b) Water	(e) Fossil fuels
(c)Rocks and mineral resources	

SCORING GUIDE FOR THE SECOND ELEMENT OF CONSTRUCT

When attempting items 5 and 6 in part two of section B, a learner must mention;

Identity of category of natural resource, reason and example, Composition of natural

resource, Impact of the natural resource on the environment, how it occurs, and mitigation, Benefit/importance of natural resource

Basis of assessment		Criteria of assessment	Score
A	Identity of category of natural resource, reason and example	Identified category of natural resource with a reason and example	03
		Identified category of natural resource with a reason OR Identified category of natural resource with example	02
		Identified category of natural resource OR example	01
		No identified category of natural resource	00
B	Composition of natural resource	Any two components of natural resource	02
		Any one component of natural resource	01
		No component of natural resource	00
C	Impact of the natural resource on the environment, how it occurs, and mitigation	Anyone Impact of the natural resource on the environment, how it occurs, and its mitigation	03
		Anyone Impact of the natural resource on the environment and how it occurs OR Anyone Impact of the natural resource on the environment, and its mitigation	02
		Anyone Impact of the natural resource on the environment OR how it occurs OR its mitigation	01
		No Impact of the natural resource on the environment, how it occurs, and its mitigation	00
D	Benefit/importance of natural resource	Any one benefit/importance of natural resource	01
		No benefit/importance of natural resource	00

Summary notes on the assessable areas for EOC 4.

Category +Reason/explanation + example	Renewable Natural resources; can be replenished e.g. Air, water. Non-renewable resources; cannot be replenished (get used up) e.g. fossil fuels, rocks/ minerals.
Composition of natural resources	Air contains Nitrogen, Oxygen Carbon dioxide, rare gases, Water contains; Hydrogen and oxygen.

	Fossil fuels contain Carbon, Hydrogen, Rocks contain Iron, copper, calcium carbonate, and other minerals like Gold, Cobalt. Trees and natural vegetation is made up of carbon, hydrogen, oxygen and magnesium
Impact of natural resources on the environment how it occurs / chemicals and physical reactions + MITIGATION	·Air - Some components of Air pollute envionment a cause global warming, and carbon dioxide because it's greenhouse gas thus traps heat in the atmosphere. - **Mitigation:** Increased Afforestation to replace the cut trees which absorb CO_2 from the atmosphere to reduce global warming. Water -Water contains dissolved gases like O_2 and CO_2 The CO_2 in it forms carbonic acid that makes water acidic. The acid rains dissolve or deplete rocks. - **Mitigation:** Re-afforestation -Hot water as an effluent from industries when introduced into the water bodies, increase the temperature of the water bodies affecting the life of aquatic organisms. - Mitigation: Hot water reservoirs and effluent deposit points
	factories to cool the exhaust water before introduction into the water bodies -Water pollution caused by farming and Agriculture. So, the use of fertilizers results in Eutrophication of nearby water bodies and Algae blooms/algal bloom. - **Mitigation:** Use of organic fertilizers e.g. manure from both animal and plant waste which are Biodegradable
Benefits of the natural resource	**Air** - facilitates respiration, during respiration carbohydrates combine with oxygen in order to release energy and carbon dioxide used for proper body functioning. - facilitates photosynthesis. During photosynthesis, carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to form glucose, carbohydrates and oxygen.

	Water - habitat for many aquatic organisms; water bodies like lakes, dams, pools contain necessary conditions for survival of aquatic animals -Water from the water bodies evaporates and eventually cools and condenses on the clouds, these results into precipitation. -Water bodies like rivers can be used to generate electricity, fast moving waters to the rivers drives turbines at waterfalls which produce kinetic energy into electrical energy

Example

As a result of increasing population in wakiso District, many of the natural forests and swamps have been destroyed to create space for construction and provide charcoal among others. This has attracted the attention of the government.

As a result, the government through the national environment management authority (NEMA) is planning to create awareness to the people of Tororo district through sensitization workshops organized in the different villages in the district.

TASK

As a chemistry learner, prepare a short presentation that you will deliver during the workshop when invited.

Responses

Category+ reason+ example

- Natural resources are either renewable or non-renewable Renewable resources; cannot be exhausted or used up or when used up cannot be replaced up easily or can be replenished e.g air, water, wind, solar etc.
- Non-renewable; cannot be used up or exhausted or where used cannot be replaced easily or cannot replenished e.g rocks and minerals.

Composition of the natural resources

- Water; compound of hydrogen and oxygen Forests; are made of trees with elements likd carbon, nitrogen and oxygen
- Alr; mixture of oxygen, nitrogen and carbon did Rocks; minerals like calcium carbonate, aluminium, Iron etc.

Impacts of activities on natural resources; how it occurs and mitigates

- Crop husbandry; fertilizers and manure are used and pollutes the water bodies and make them un safer for use. This can be mitigated by sensitized framers to use controlled doses of fertilizers and manure in gardens or use organic fertilizers.
- Crop/ animal husbandry trees and other vegetation are cut down to create space; water cycle is disrupt hence, when less rain is received. This can be mitigated by planting trees that grown and mature fast.
- Crop/ animal husbandry; trees and other vegetation are cut down to create space; carbon dioxide accumulates in the atmosphere-hence, global temperature rinses and rainfall formation reduces. This can be mitigated by planting trees that grow and mature fast.
- Stone quarrying involves breaking rocks for other uses like building. This leads to water contamination by quarry
- Mills rises toxic wastes and other wastes like plastics which are thrown into landfills. These reduce sol productivity hence some crops will die dry out. The waste may also be washed to the different water sources and this the waste water not safe for using by living organisms. This can be mitigated by putting in the strict laws against the disposal of wastes

Benefits/ importance of natural resources to everyday life (mentioned benefits and explained)

- Air is used for respiration; food is broken down to release energy for proper body functioning Air facilitates photosynthesis; carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to make glucose and oxygen Water bodies help in rain formation; liquid water is converted into water vapour using energy from the sun which rises to the sky later cooled into clouds-which then returns as rainfall
- Water bodies provides water for irrigation; this helps to cool crops and make them to grow healthy and hence, boost food production
- Water bodies provides water for drinking; this help to cool our bodies and dissolve the food we eat, to get rid of the wastes through urination

- Generate HEP; fast moving waters drive the turbines; and turbines mechanical energy is converted into electricity
- Forests/ trees provides us with oxygen; during photosynthesis oxygen is released and can be used during respiration
- Forests/ trees reduce greenhouse effects; since the use carbon dioxide during photosynthesis and oxygen which can be used during respiration is released
- Trees from the forest are used as fuels; since they burn to release heat energy which can be used for cooking etc.

ITEM SEVENTEEN

Tororo District is developing at a fast pace. There are many trading centers that have been established in the different villages. Many swamps and forests have been reclaimed and filled with new buildings. Stone quarrying is the order of the day. Recently both the vegetation and wells have started drying up, and yet the little water that is available is not fresh. The few residents in the different villages that practice crop husbandry also say that seasons have changed and this has caused and this has caused famine in some parts of the district. All these happenings have left many of the district officials wondering.

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- A sensitization workshop is to be organized by the chairperson local council **V** through the different village environmental management committees.
- **TASK;**
- As a learner of chemistry, present the message you will share when called upon.

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ITEM EIGTEEN

Due to the increased number of old automobiles in Kampala City and the neighboring regions, there has been an increase in the rate of air pollution. The regional head teachers, through their association have agreed to have the students as the frontliners of a healthy environment and are organizing a meeting to formulate a guide to be presented to their students.

Task:

As a chemistry student, help your headteacher by writing a presentation he will share with the fellow headteachers in their discussion.

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The officials are planning to create awareness to the people of the country through sensitization workshops organized in different district communities.

Task:

As a chemistry learner, prepare a short presentation you will deliver during the workshop upon invitation.

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ITEM TWENTY

Kyevunze, a rocky village in Luwero district is developing at a fast pace. There are many trading centers that have been put in place. Many swamps and forests are now filled with buildings. Stone quarrying is the order of the day. Recently the wells are drying up and yet the little water that is available is not fresh. The few that practice crop husbandry also say that seasons have charged and this has caused famine in the area. All these happenings have left many residents wondering why

A sensitization workshop is to be organized by the chairman through village. Environmental Management committee.

Task;

As a learner of chemistry, present your message upon invitation.

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ITEM TWENTY THREE

The recent research by the scientists at Makerere University stipulates that there is increased health risks to the residents of Kampala City due to poor air quality. In one of their sittings, the councilors of Kampala Capital City Authority (KCCA) concluded that there is an urgent need to start raising awareness to the residents about a clean and healthy environment.

Task:

As a chemistry student through the science club at your school, write an article to be published in the Saturday newspaper.

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ITEM TWENTY FOUR

Fresh water bodies like lakes and rivers have been heavily encroached on as a result of increasing Uganda's population. Many people have cleared all the vegetation around the lakes to set up buildings and beaches. Many industries are dumping their waste products in these water bodies. Fishermen are using poor method of fishing ending up killing other species in

the water. On this year's **World Environment** Day, the science club in your school wishes to raise public awareness among the entire students' community on the matter.

The science club at your school has selected you to give a presentation **on that day** following a theme **"SAVE OUR WATER BODIES".**

Task;

Make a write up you will use upon the invitation.

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TWENTY FIVE

Peter, the cattle keeper, grazes his cattle on a community land. During the dry season, he practices bush burning and also takes his cattle to drink water from the community water source. Peter's practices have raised concern in the community. The area chairperson has organized a meeting to create awareness for Peter and the community.

Task: As a learner of Chemistry make a write-up of the message the chairperson will present to the community.

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During her School holidays, Eva visited her aunt who works at a stone quarry. She noticed that explosives were being used to blast big rocks to form small stones (aggregates) and there was a lot of dust rising into the air besides the social benefits, Eva was concerned about what would happen to the site and community if the activity continued over time.

Task: As a learner of Chemistry, make a write-up to respond to Eva's concern.

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CHEMISTRY PAPER TWO - PRACTICAL PAPER 545/2/3

FIFTH ELEMENT OF CONSTRUCT (ITEM ONE I

N PAPER 2 AND 3)

The learner understands that chemistry is a process of evidence-based enquiry involving the collection of evidence and the development of theories that help us explain the evidence (science process skills)

ASSESSIBLE AREAS

This includes all related topics (competences) in the entire syllabus where a practical item can be set but special attention can be put on the following assessible areas.

1. Chemical reaction rates	5. The reactivity series
2. Energy changes during chemical reactions	6. Solubility of Salts
3. Formulae, stoichiometry and mole concept	7. Soapy detergents and hardwater
4. Freezing and melting points	

Presentation of scientific study/ inquiry / investigation should follow the order;

a. Aim of the experiment/title
b. Stating the hypothesis
c. Stating the variables
d. Procedure with relevant materials
e. Risks and ways of mitigating the risks
f. Data presentation and data recording
g. Data analysis and interpretation
h. Conclusion

SCORING GUIDE

N0	**Basis of Assessment**	**CODE**	**Assessment criteria**	**Scoring**
A	**Aim of the experiment**	**A**	• Aim of experiment with both key words	02
			• Aim of experiment with one key word	01
			• No aim of the experiment	00
		V	• Independent (ID), dependent (DV) and controlled (CV)	03

B	**Variable for the experiment**		• Independent and dependent or independent and controlled or dependent and controlled variable	02
			• Independent or dependent or controlled variable	01
			• No variable	00
C	**Hypothesis**	**H**	• Hypothesis related to experiment with both key words	02
			• Hypothesis related to experiment with one of key words	01
			• No / wrong hypothesis of the experiment	00
D	**Procedure of the experiment with relevant materials**	**P**	• Relevant material, relevant procedure, coherent procedure of the experiment	03
			• Relevant materials and procedure	02
			• Either relevant material or relevant procedure	01
			• No relevant material and procedure	00
E	**Risks and Mitigations**	**R**	• Any one risk identified and mitigated	02
			• Any one risk identified or mitigated	01
			• No risk identified or mitigated	00
F	**Presentation of data**		• 2/3 of required sets of data appropriately presented	04
		D	• 1/3 of required sets of data appropriately presented	03
			• Data appropriately presented without required sets	02
			• Data partially appropriately presented with no required sets	01
			• No set of data presented	00
G	**Recording of Data**		• Appropriate recording of data within the error margin	04
			• Partial appropriate recording data within the error margin	03

		Dr	• Appropriate recording of data outside the error margin	02
			• Partial appropriate recording of data outside error margin	01
			• No data recorded/ data recorded outside error margin	00
H	**Data analysis and interpretation**	**I**	• Appropriate and accurate	03
			• Appropriate and partially accurate	02
			• Appropriate and inaccurate	01
			• Inappropriate and inaccurate	00
I	**Conclusion**	**C**	Conclusion based on data interpretation	01
			No conclusion based on data interpretation	00

ITEM TWENTY SIX

During the preparation of sodium chloride, workers in one of the industries amazingly noticed that the reaction vessels became hotter even when there was no heating.

$$HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O(l) + heat$$

You are provided with:

- **BA1** which is sodium hydroxide solution
- **BA2** which hydrochloric acid

TASK

Design an experiment to prove that heat is evolved and how much heat can be evolved

Task:

(a) As a learner of chemistry;

(i) Design an experiment you will carry out to determine the amount of heat, produced during reaction between **BA1** and **BA2** or produced when **BA1** is added to **BA2**.

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ITEM TWENTY SEVEN

Rashida is who intends to make a presentation during science fair on alternative energy solutions. He wants to use reaction of iron with copper(ii) sulphate to generate heat however he does not know the maximum amount of heat produced during the reaction.

Iron reacts with copper(ii) sulphate according to the following reaction.

$CuSO_4(aq)+Fe(s) \longrightarrow FeSO_4(aq)+Cu(s)$

You have been contacted to help rashid and you are provided with the following

BA1 which is $30cm^3$ of copper(ii) sulphate solution.

X which is iron

Task:

As a learner of chemistry

a) Design an experiment to determine that you will use to determine the maximum heat for the reaction.

   (your design should include AIM,HYPOTHESIS,VARIABLES,APPARATUS and MATERIALS,PROCEDURES,RISKS and their MITIGATION)

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b. Carry out an experiments and record your results.